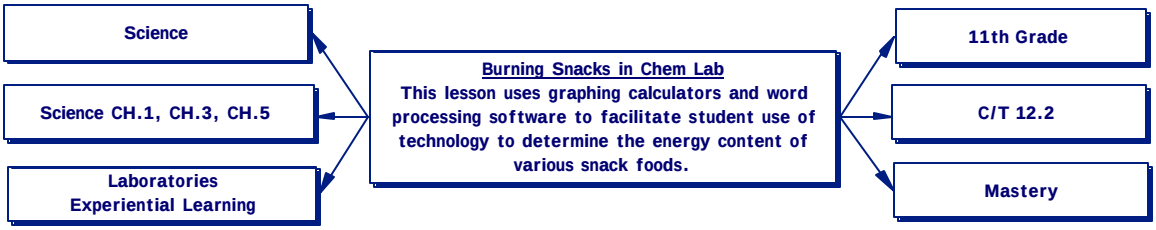

Burning Snacks in Chem Lab

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Curriculum Area	Science
Subject Area	Chemistry
Grade Level	11th grade
Learning Objectives	• The student will be able to use technology to determine the energy content of various snack foods by measuring the temperature change caused by burning the snack food. • The student will analyze data gathered from an experiment using graphs and data tables.
Correlation to the SOL	Science CH.1, CH.3, CH.5 C/T 12.2
Video/Technology Hardware/Software Needed	**For class:** Computer with printer (preferably color) Word Processing software (such as *Microsoft Word* or *ClarisWorks*) **For each team of 2 students:** CBL System (from Texas Instruments) TI-83 Graphing Calculator Vernier (or TI) temperature probe Vernier adapter cable Software for the TI: *GraphLinks* by Texas Instruments (http://www.ti.com), *Vernier Graphical Analysis* (http://www.vernier.com), and *Vernier ChemBio Program for TI-83*
Materials Required	**For each team of 2 students:** *Laboratory Manual: Chemistry with CBL*™, written by Dan D. Holmquist, Jack Randall, and Donald L. Volz, published by Vernier Software, 8565 Beaverton-Hillsdale Hwy, Portland, Oregon 97225-2429 (http://www.vernier.com, 1-503-297-5317) Two or mo re food samples (at least one carbohydrate and one food high in fat) Food holder (e.g., large paper clip) Wooden splint Utility clamp and slit stopper Stirring rod

	Ring stand and 4 inch ring 100 ml graduated cylinder Small can (e.g., 12 oz. soda can) Cold water Matches **For each student:** Goggles A copy of the Burning Snacks in Chem Lab worksheet, also teacher's version
Procedures/Activities	NOTE ON SAFETY: Since an open flame is used, the teacher needs to make students aware of related safety issues. Point out the location of a fire extinguisher. 1. Follow the directions for the Vernier Experiment #16, The Energy Content of Foods, in the Lab Manual *Chemistry with CBL*™. Students should work in teams of 2. 2. This particular laboratory experiment is designed to test the energy content of foods. By measuring the temperature increase in a sample of water, the energy content of various foods can be determined. That energy content can be calculated using the equation $\Delta H = m\ s\ \Delta T$, where ΔH is the energy content (or Heat), m is the mass of the water sample, s is the specific heat capacity, and ΔT is the change in temperature of the water. 3. The students will use the CBL Technology to make their temperature measurements. Analyze the data for different teams. Each team should be able to calculate the energy content for its specific food using the data gathered in the experiment. Using some further calculations, it is possible to convert the energy value of the food from Joules to Calories, a more familiar unit of energy as it applies to foods. The concept of specific heat capacity is discussed in most high school Chemistry textbooks. 4. The student's analysis should include downloading the data from the TI Graphing Calculator into a computer in order to print various graphs. One graph can show the data from each team of students. Another might be a graph for each food type. It is highly recommended that the class print a graph that shows each of the food types on one graph. A color graph would emphasize the difference in the data on the one graph. The graphs can be easily made using the software programs *GraphLinks* and *Graphical Analysis*. 5. Have the students complete a data table using a word processor. The table should include: • across: a list of the foods • down: initial temperature (of the water), maximum temp (of the water), calculated Heat (J) and calculated heat (calories), Calories (according to the food package), total grams of fat (package), and grams of carbohydrates (package), did the fire drip grease while burning (yes or no), did the water cool quickly? (yes or no).
Content Assessment	The questions on the worksheet include some (#1-6) that can be done as homework and the rest can be done together in class. Depending on what is covered in class, some or all of the other questions can also be done for homework. The data table should be evaluated as well.
Technology Integration Assessment	One way to evaluate student use of technology is to have the data from each team's experiment downloaded into a computer. Then the data can be graphed and compared to other teams' data.
Extensions	**Health:** The energy content of each food can be converted into Calories and that value can be compared to the Calorie count on the package label. The fat content of the food can be compared the graph and the temperature change and the impact of a diet high in fat content can be discussed.

Worksheet for
Burning Snacks in Chem Lab

Which food(s) did you work with and burn?

Describe the fire your food produced, compared to other fires that you observed.

What types of food seem to have the biggest fire?

What is the initial temperature of your water in the experiment?

What is the maximum temperature of your water?

What key/function on your calculator allows you to determine the maximum temperature quickly?

What is the mass of the water added to the can?

Why is it not necessary to measure the mass of the water by use of a balance? Hint: the density.

What equation is used to determine the heat given off by the food?

What does each letter/symbol stand for in the equation?

How much heat was given off by your food sample?

What is a calorie? (You can look this up in a dictionary.)

What is the definition of a Calorie, used to measure the energy content of foods?

One calorie = ____ joules.

Was your reaction exothermic or endothermic? Explain.

Worksheet for
Burning Snacks in Chem Lab

Which food(s) did you work with and burn?

Describe the fire your food produced, compared to other fires that you observed. [Foods high in fat should have a much more noticeable fire as compared to food with almost no fat, e.g., marshmallow.]

What types of food seem to have the biggest fire?

What is the initial temperature of your water in the experiment?

What is the maximum temperature of your water?

What key/function on your calculator allows you to determine the maximum temperature quickly? [answer: Trace, while in the graph]

What is the mass of the water added to the can?

Why is it not necessary to measure the mass of the water by use of a balance? Hint: the density. [answer: the density of water is 1 g/ml; thus 100 ml = 100 g of water]

What equation is used to determine the heat given off by the food?

What does each letter/symbol stand for in the equation?

How much heat was given off by your food sample?

What is a calorie? (You can look this up in a dictionary.)

What is the definition of a Calorie, used to measure the energy content of foods?

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